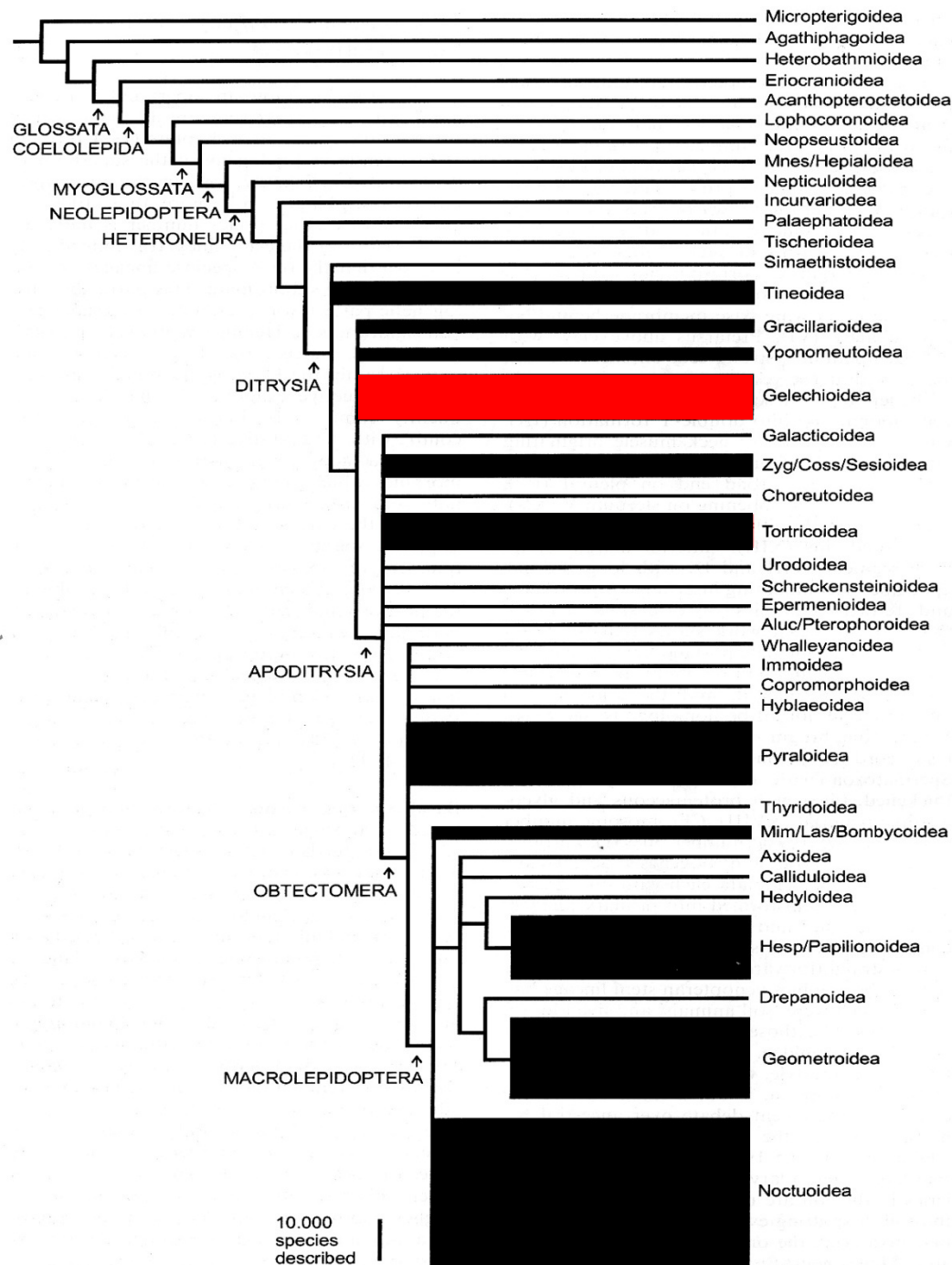


# The Major Families of Gelechioidea (Lepidoptera) in North America

Sangmi Lee

Mississippi Entomological Museum  
Mississippi State University





**At least 1,425 genera and more than 16,000 described species worldwide**

**- About 1600 species in 205 genera in America north of Mexico**

**(Kristensen , 1998)**

# Classification of Gelechioidea

Hodges (1998)

Kaila (2004)

Nieukerken *et al.* (in press)

## Handbuch der Zoologie Handbook of Zoology

### Band/Volume IV Arthropoda: Insecta

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Maximilian Fischer

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Niels P. Kristensen (Volume Editor)

## Lepidoptera, Moths and Butterflies

Volume 1: Evolution, Systematics, and Biogeography

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Cladistics 20 (2004) 303–340

### Cladistics

www.blackwell-synergy.com

### Phylogeny of the superfamily Gelechioidea (Lepidoptera: Ditrysia): an exemplar approach

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Accepted 12 May 2004

#### Abstract

Phylogenetic relationships within the megadiverse lepidopteran superfamily Gelechioidea have been poorly understood and consequently the family level classification has been problematic. An analysis of phylogeny using 193 characters, including 241 informative character states, derived from larval, pupal and adult morphology and larval ecology, was performed to resolve the phylogeny of the Gelechioidea. 143 species representing the diversity of the putative Gelechioidea were included, supplemented with 13 species representing 11 other Ditrysian families. The monophyly of the Gelechioidea was supported, although only with homoplastic characters. The putative position of the Gelechioidea as the sister group of the Apoditrysia was not supported, since the Gelechioidea was nested within this clade. The Gelechioidea was divided into two main lineages: (1) the gelechioid lineage constituting Deocloidae, Syringopinae, a re-composed Coleophoridae (including Coleophorinae and Batrachodesinae as paraphyletic Xyloryctidae of authors, some oecophorids of authors, Deuterogoniinae and Blastobasinae), Oecophoridae s.s., Amphibolidae s.s., Carcinoidea, Stenomatidae, Chimabachidae and Elachistidae (including Depressariinae s.s., Telerhyssini, Ethminiinae, Hypertropiinae s.l., miscellaneous "amphibolids" sensu authors, Acolathinae, Parametristiinae, Agonoxeninae and Elachistinae). Detritivory/fungivory may have evolved only twice within Gelechioidea, though the evolution of larval food substrate use frequently reverses. To avoid an unnecessary further proliferation of names, it is recommended that no further family group names are introduced within the Gelechioidea, unless based on a rigorous analysis of inter-relationships.

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Gelechioidea is a cosmopolitan, megadiverse radiation of Lepidoptera, belonging to "Microlepidopteran" Ditrysia. The superfamily comprises over 16 000 described species (Hodges, 1998) and innumerable undescribed ones. For example, according to Hodges (1998) only 10–40% of species are presently named in several species-rich gelechioidean families in the Nearctic region. The ratio is probably similar, or even worse, in other regions of the World, except in Europe and Russian Asia. For example, in the Sub-Saharan Africa, only the Gelechiidae and Lecithoceridae of South Africa have been more thoroughly studied (Janse, 1969–74; Janse, 1978–63).

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Gelechioidea may be the least known superfamily of Lepidoptera (Hodges, 1998) and it may eventually be among the three largest lepidopteran radiations together with Pyraloidea and Noctuoidea.

The spectrum of lifestyles among gelechioid larvae is diverse. Among the taxa there are predators of other insects, scavengers, detritus and fungus feeders, although feeding on living plant material is prevailing. Species dependent on living plant tissue can be external feeders, borers or miners of any plant tissue: roots, stems, leaves, flowers or seeds (Powell *et al.*, 1998). Larvae in several gelechioid lineages bear portable cases. Many of the external feeders conceal themselves within silky tents or webs, or by tying leaves. Some shelter in silky galleries in the soil from which they consume plant roots or attack leaf rosettes or other above-ground parts of plants.

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### Animal biodiversity: An outline of higher-level classification and survey of taxonomic richness

Nieukerken, E.J. van, *et al.*

Order **Lepidoptera** Linnaeus, 1758 (4 suborders) (15,578 genera, 157,424 species, 50.84) : 2.2

† Unassigned early **lepidopterans** (4 families)

† Family unassigned (12 genera, 16 species, 12/16) <sup>4</sup>

† Family **Archaeolepididae** Whalley, 1985 (1 genus, 1 species, 1/1) <sup>4</sup>

† Family **Mesochristenseniidae** Huang, Wei & Min, 2010 (1 genus, 3 species, 1/3) <sup>4</sup>

† Family **Eolepidopterigidae** Fennelly, 1983 (1 genus, 1 species, 1/1) <sup>7</sup>

† Family **Undopterigidae** Kodov, 1988 (1 genus, 1 species, 1/1) <sup>4</sup>

Suborder **Zenopsis** Chapman, 1917 (1 superfamily)

Superfamily **Micropterigidae** Henrich-Schäffer, 1855 (1 family)

Family **Micropterigidae** Henrich-Schäffer, 1855 (21 genera, 160 species, 3/6) <sup>4</sup>

Suborder **Aglossata** Spädel, 1977 (1 superfamily)

Superfamily **Agathiphagoidea** Kristensen, 1967 (1 family)

<sup>1</sup>By Erik J. van Nieukerken, Lauri Kaila, Im J. Kitching, Niels P. Kristensen, David C. Lee, Jodi Min, Charles Norg, Marco Nuss, Teresa C. Riegler, Thomas J. Simonsen, Nikolai Shakhov, Boris Yan, Peter Zahner, David Adamski, Joaquin Ballester, Daniel Bartsch, Bengt A. Bengtsson, John W. Brown, Sibylla Buchs, Donald R. Davis, Juan De Prins, Willy De Prins, Marc E. Eysen, Patricia Gassio-Pool, Cees Gielis, Peter Hübner, Axel Kallies, Jeremy D. Holloway, Axel Kallies, Ole Karlsen, Akiko Y. Kawanishi, Sanku C. Kotte, Nikolai V. Kodov, J. Donald L. Hovius, Gerard L. Lamas, Jean-François Lander, Sanku Lee, Matthias Nuss, Kyu-Tak Park, Carla Perez, Jadwiga Rota, D. Christian Schmidt, Alexander Schreiner, Jan-Christoph Scholz, M. Alma Solis, Gerhard M. Tonn, Andrew D. Warren, Susan Waller, Roman V. Yakovlev, Vadim V. Zolotarev, Andreas Zwick

<sup>2</sup>The classification largely follows that in the Handbook of Zoology (Kristensen, 1998), and the later update (Kristensen *et al.* 2007). Recent molecular studies of Ditrysia (Ragge *et al.* 2009; Murman *et al.* 2010) are responsible for several novelties, such as the position of the butterflies (**Papilionoidea**) and the synonymy of **Spinoidea** with **Noctuoidea**.

<sup>3</sup>When possible, numbers of genera and species are based on counts in existing databases, whether published (then cited) or personal. Where not available, often for larger taxa, numbers provided by Handbook authors were updated with Zoological Record data (up to early July 2011). **Lepidoptera** (**Macropodae** *et al.* 2007) has been an additional source.

# Families of North American Gelechioidea

Autostichidae  
Batrachedridae  
Blastobasidae  
Chimabachidae\*  
Coleophoridae  
Cosmopterigidae  
Elachistidae  
Gelechiidae

Lypusidae  
Momphidae  
Oecophoridae  
Peleopodidae  
Pterolonchidae  
Schistonoeidae  
Scythrididae

\*introduced

# Families of North American Gelechioidea

Autostichidae

Batrachedridae

Blastobasidae

Chimabachidae

Coleophoridae

Cosmopterigidae

Elachistidae

Gelechiidae

Lypusidae

Momphidae

Oecophoridae

Peleopodidae

Pterolonchidae

Schistonoeidae

Scythrididae

# Gelechioidea

- ✓ Haustellum (Proboscis) scaled  
(also in Pyraloidea and Choreutoidea)



# Gelechioidea

- ✓ Haustellum (Proboscis) scaled (also in Pyraloidea and Choreutoidea)
- ✓ Labial palpus three segmented, usually upturned



# Gelechioidea

✓ Chaetosemata absent



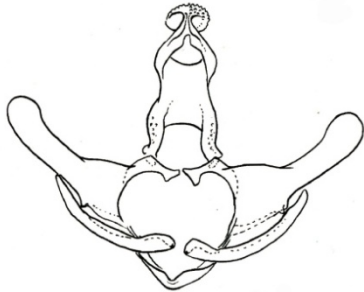
Chaetosemata in Tortricidae

## Gelechioidea

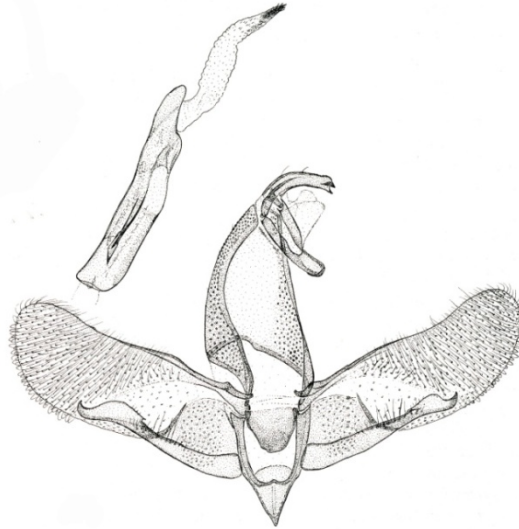
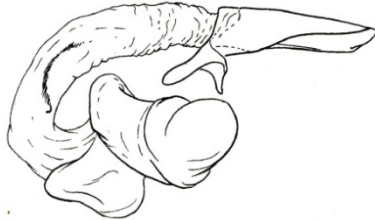
- ✓ Dorsal surface of hind tibia with long, slender scales



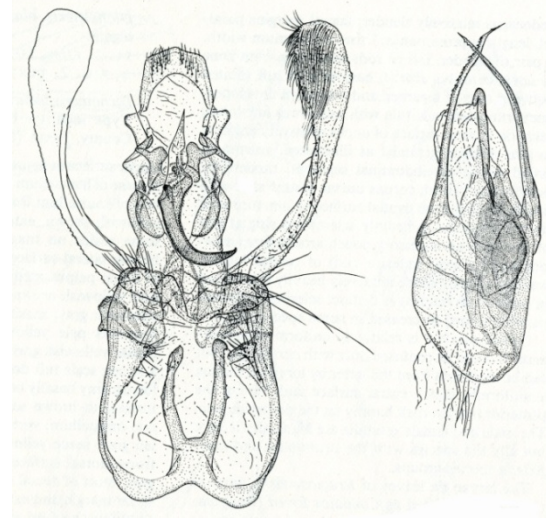
# Male genitalia of Gelechioidea



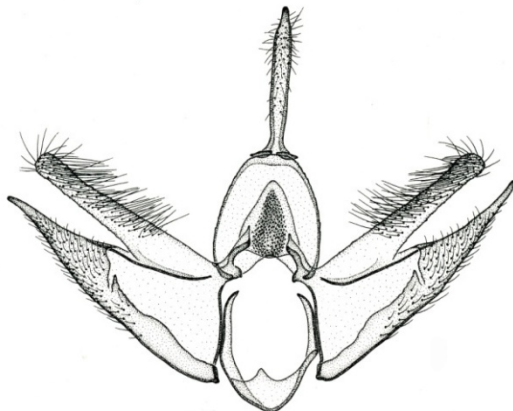
Coleophoridae



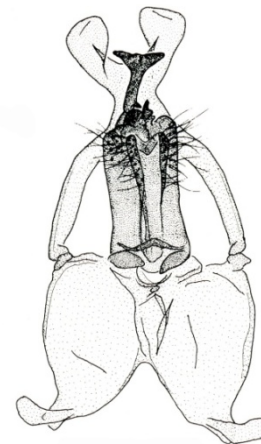
Autostichidae



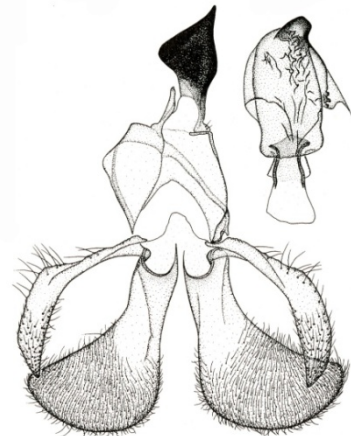
Gelechiidae



Momphidae



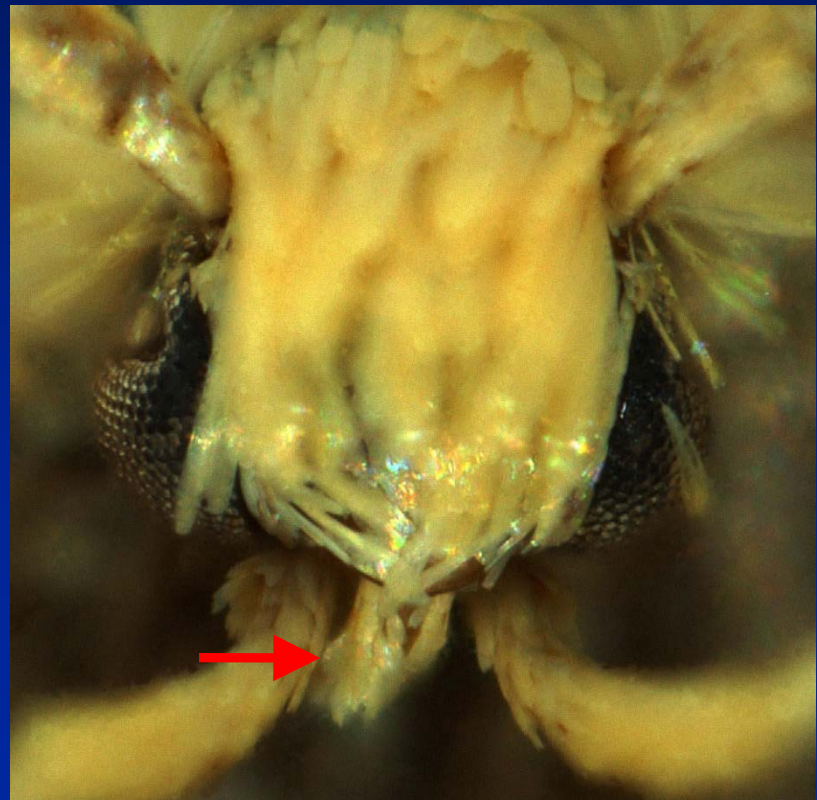
Scythrididae



Cosmopterigidae

# 1. Family Elachistidae (Grass-mine moths)

- ✓ Maxillary palpus reduced, one- or two-segmented



# 1. Family Elachistidae (Grass-mine moths)

- ✓ Maxillary palpus reduced, one- or two-segmented
- ✓ Fore- and hindwings narrow



# Family Elachistidae

- ✓ Diversity in North America:  
7 genera, 140 species



# Biology of Elachistidae

## Larval habits:

- ✓ Leaf tiers, leaf rollers, leaf miners, seed feeders, stem borers, or external feeders on various dicots and monocots



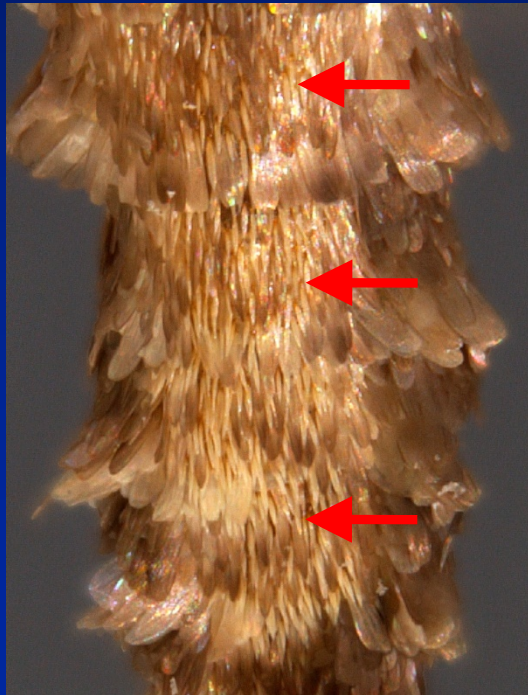
*Elachista madarella*. Larva, adult and leaf mine on a sedge, *Carex* sp. (Cyperaceae)



*Perittia herrichiella*. Adult and leaf mine on Eurasian bush honeysuckle, *Lonicera* sp. (Caprifoliaceae)

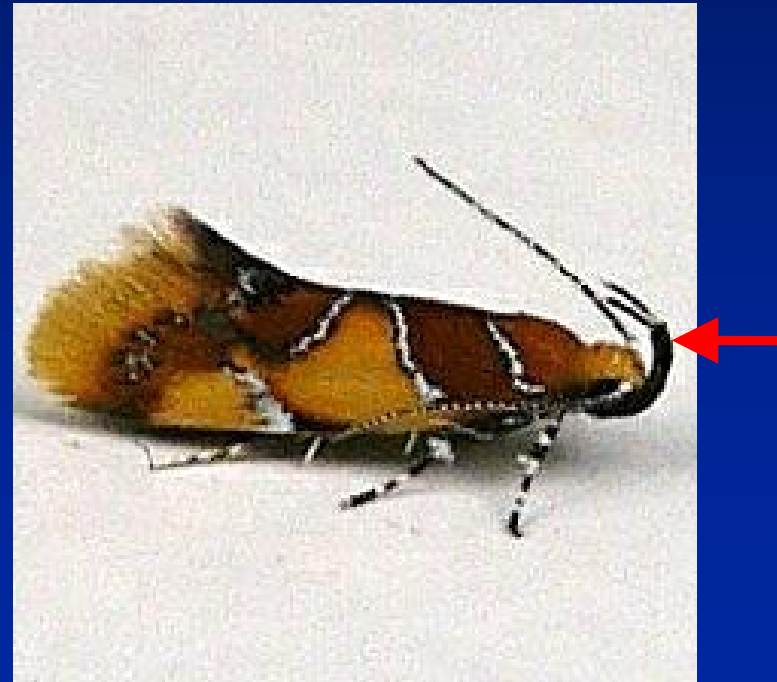
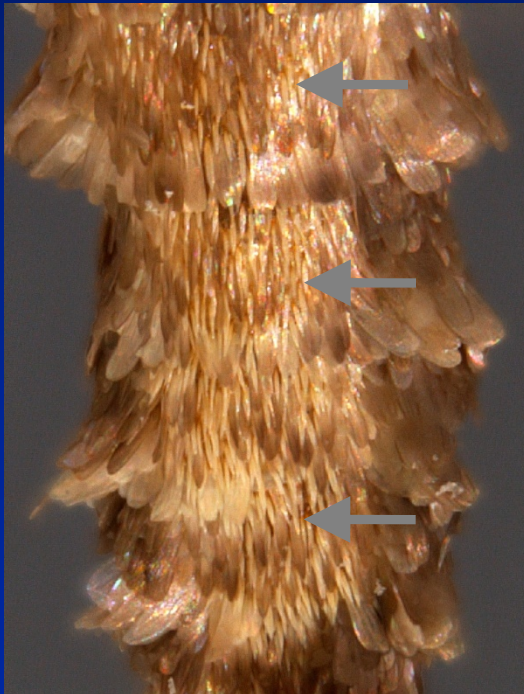
## 2. Family Oecophoridae

- ✓ Abdominal terga without spiniform setae or with these setae in a broad band



## 2. Family Oecophoridae

- ✓ Abdominal terga without spiniform setae or with these setae in a broad band
- ✓ Labial palpus often very long and slender



# Family Oecophoridae

✓ Diversity in North America:

22 genera, 42 species

- at least 20 species in the western states



# Biology of Oecophoridae

## Larval habits:

- ✓ Mainly on dead plant tissue, leaf litter, and other vegetative matter
- ✓ Variety of habits: portable cases, tunneling into wood, and tying leaves

### 3. Family Blastobasidae

- ✓ A row of spiniform setae across each segment of abdomen



### 3. Family Blastobasidae

- ✓ A row of spiniform setae across each segment of abdomen
- ✓ Antennae notched in males of some genera



Terry Harrison

### 3. Family Blastobasidae

- ✓ A row of spiniform setae across each segment of abdomen
- ✓ Antennae notched in males of some genera
- ✓ Resting adults at blacklights with V-shaped separation of apical ends of wings



Terry Harrison

# Family Blastobasidae

- ✓ Diversity in North America:  
7 genera, 118 species



# Biology of Blastobasidae

## Larval habits:

- ✓ Scavengers on leaf litter
- ✓ Some predators on scale insects
- ✓ Some internal feeders on seeds of Pinaceae or acorns
- ✓ Some stem borers on grasses



## 4. Family Coleophoridae (Casebearer moths)

- ✓ Antennal pecten present



## 4. Family Coleophoridae (Casebearer moths)

- ✓ Antennal pecten present
- ✓ Two patches of spiniform setae on each segment of abdomen



## 4. Family Coleophoridae (Casebearer moths)

- ✓ Antennal pecten present
- ✓ Two patches of spiniform setae on each segment of abdomen
- ✓ Larvae with diverse cases



# Family Coleophoridae

- ✓ Diversity in North America:  
5 genera, 169 species



# Biology of Coleophoridae

## Larval feeding habits:

- ✓ 34 plant families
  - especially Juncaceae and diverse dicots
- ✓ Internal feeders on leaves, flowers, or seeds in the early instar, then later external feeders bearing cases but mining leaves



*Coleophora serratella* Left: mine in *Betula pubescens*; Center: very young youth case; Right: case of fullgrown larva

## 5. Family Mommphidae

- ✓ Small, narrow-winged moths with two or more tufts of upraised scales on the forewing



Terry Harrison

# Family Momphidae

- ✓ Diversity in North America:  
2 genera, 40 species



# Biology of Momphidae

## Larval habits:

- ✓ Internal feeders as stem/flower/fruit borers or leaf miners on living tissue
- ✓ Mainly Onagraceae, also Asteraceae, Fabaceae, and Fagaceae



Adult

*Mompha terminella*: leaf mine on enchanter's nightshade (Onagraceae).

Terry Harrison



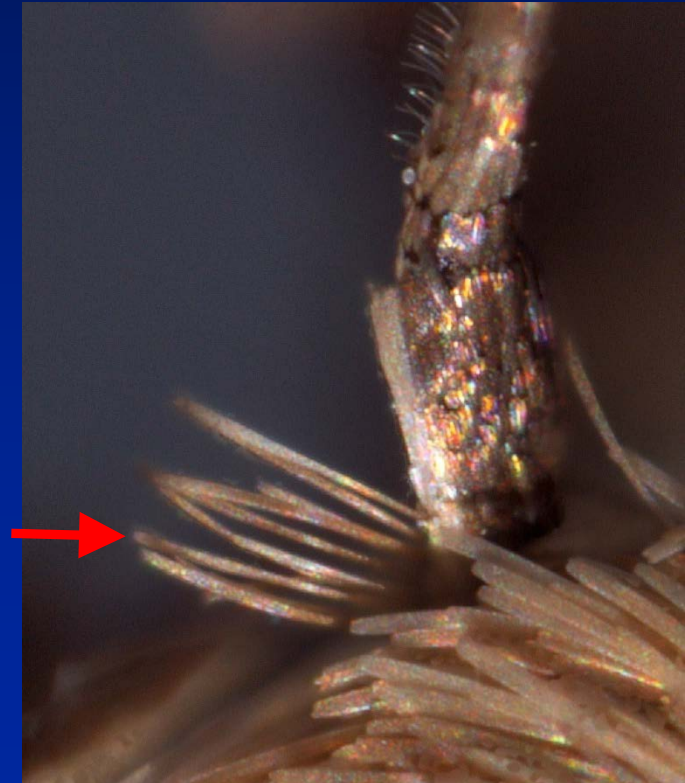
Adult

*Mompha rufocristatella*. Left: cocoon inside gall; Right: gall on stem of *Gaura biennis* (Onagraceae).

Terry Harrison

## 6. Family Scythrididae

- ✓ Antennal pecten present



## 6. Family Scythrididae

- ✓ Antennal pecten present
- ✓ Teardrop-shaped at rest



Moth Photographers Group



# Family Scythrididae

- ✓ Diversity in North America:  
5 genera, 46 species



# Biology of Scythrididae

## Larval habits:

- ✓ External feeders on buds and leaves within weak webs on more than 20 families
- ✓ Some leaf miners on Asteraceae

## Adults:

- ✓ Many species diurnal and can be found on flowers of hosts or on substrates near the host
- ✓ Some species brachypterous



*Scythris immaculatella*.  
Moth on flower of *Rudbeckia* sp.  
(Asteraceae).

Jean-François Landry, Cancoll

## 7. Family Cosmopterigidae

- ✓ Fore- and hindwings narrow



## 7. Family Cosmopterigidae

- ✓ Fore- and hindwings narrow
- ✓ Forewing often with scales forming tubercles



Robert Chapman

## 7. Family Cosmopterigidae

- ✓ Fore- and hindwings narrow
- ✓ Forewing often with scales forming tubercles
- ✓ Eye incised by inception of antenna



Robert Chapman

# Family Cosmopterigidae

- ✓ Diversity in North America:  
24 genera, 175 species



# Biology of Cosmopterigidae

## Larval habits:

- ✓ Leaf miners/tiers, bark miners, stem and root borers/  
gall makers, flower/seed feeders
- ✓ At least 26 families of angiosperms
  - especially Fabaceae, Asteraceae, Cyperaceae,  
Poaceae, and Rosaceae
- ✓ Larvae of *Euclemensia* parasitoids of Kermes scale  
insects

## 8. Family Gelechiidae (Twirler moths)

- ✓ Hindwing usually with outer margin excavated below the apex



# Family Gelechiidae

- ✓ Diversity in North America:  
92 genera, 886 species



# Biology of Gelechiidae

## Larval habits:

- ✓ Leaf rolling/tying, seed feeding, gall forming, and leaf/needle mining
- ✓ 82 plant families (Gymnospermae and Angiospermae)

## Adults:

- ✓ Mostly flying at dusk or during the night
- ✓ A few diurnal

**“Let’s collect some gelechioids”**



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